Vol. XLI, No. 10 Concrete October, 1933

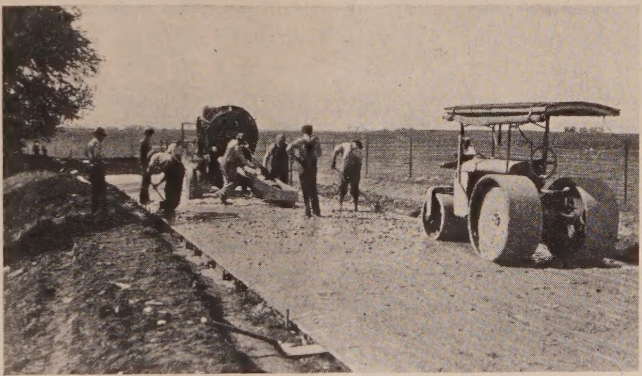
Cement-Bound Macadam Road Project Financed by Scrip

Mason City Commercial Club Inaugurates Work as Employment Relief Measure—Work Given to Registered Unemployed Heads of Families

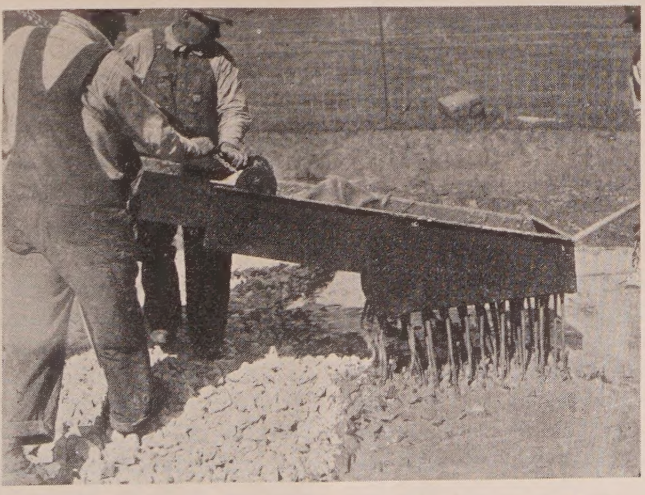
MASON CITY, Iowa, recently completed 3,820 lin. ft. of cement-bound macadam pavement as a relief measure, employing for a period of 3 or more days the heads of over 200 families. The project was financed entirely by scrip that is to be retired with funds from the sale of stamps, one of which must be attached to the scrip each time it changes hands, or each week it is in circulation.

The project was inaugurated by the Commercial Club, and was backed by the responsible merchants of the community, who agreed to finance redemption of the scrip, in case the redemption by stamps failed, and to accept a specified amount of scrip each week, from customers. Scrip was issued in $1.00 units. Scrip stamps were purchased from the Commercial Club. When a customer presented scrip, he was sold a 2-cent stamp which was affixed to the back of the scrip and cancelled with the customer's initials. When the merchant paid the scrip out to his employees or to other local industries, he also affixed a 2-cent stamp. Dated spaces were provided to be covered by the stamps, and if the scrip is held until after an uncovered date, an additional stamp must be affixed, to cover that date. Retirement of the scrip within a year's time is thus made certain. When 52 stamps have been affixed to a unit of scrip, it is redeemed by the Commercial Club for $1.00 in cash. A total of $10,000 in scrip was issued, and was used in paying for labor, materials and all expenses incident to the pavement construction.

The pavement is 16 ft. wide and 6 in. thick. It was built on River Drive, a street on the east city limits, which parallels the Winnebago River. At present it is used only by pleasure vehicles, but when the drive is extended it will form a short-cut for trucks going to industries in the northern part of the city.



Grout was delivered from a central mixing plant with truck mixers and the slab was compacted with a 3-wheel roller weighing about 4 tons



Grout distributor box used on end of chute to check velocity of grout and direct it downward

As the object of the construction was to provide work for the registered unemployed, mechanical equipment was reduced to a minimum. Grading consisted of digging side ditches and leveling the subgrade, and was all done by hand. The equipment used in slab construction consisted of 1,000 ft. of steel forms, a triplex pump and about 1,000 ft. of water pipe, an Austin pup roller, weighing about 4 tons, and small tools, such as brooms, shovels and stone hooks. The small tools were purchased outright. Other equipment was rented.

Placing the Grout

Grout was mixed at a central plant and hauled to the job in from 1 to 3 truck mixers, each carrying $1\frac{1}{2}$ cu. yd. Trucks were equipped for chute discharge. Grout ran down the chute with such velocity that it disturbed the stone, washing depressions in it. A distribution box was therefore attached to the end of the chute. It had 3 baffle plates that retarded the flow of grout, and 1-in. holes in the bottom, that directed the grout vertically downward.

Crushed Limestone as Aggregate

Crushed limestone, from $1\frac{3}{4}$ to 3 in. in size, was the coarse aggregate used for 3,335 ft. of the slab. It was purchased from a nearby quarry and hauled directly to the job. It was of excellent quality, having a loss of only 5.4 per cent in the standard test for abrasion. It weighed 84 lb. per cu. ft., loose measure.

Uncrushed pebbles were used for 485 ft. of the pavement, as an experiment, since they had not previously been used in modern cement-bound macadam construction. The pebbles ranged from $1\frac{1}{2}$ to 3 in. in size and were a mixture of limestone, sandstone, trap and some other materials. Fourteen samples had a minimum loss in the abrasion test of 7.2 per cent, a maximum of 18.8 per cent and an average of 11.6 per cent.

Construction Procedure

Construction consisted of shaping and rolling the subgrade, placing forms, depositing and leveling stone, depositing and spreading grout, rolling, finishing and curing the grouted slab.

Seven-inch forms were used to build the 6-in. pavement, so they were embedded 1 in. in the subgrade. The subgrade was rolled with the 4-ton roller, then the coarse aggregate was spread by hand. Both the limestone and pebbles were spread to an assumed loose depth of $7\frac{1}{2}$ in. Calculation from the weights of materials actually used indicated that the average depth of limestone was 7.27 in. and of pebbles 7.36 in. Cores taken after the pavement was completed showed that the slab built with limestone had a depth of 6.1 in. and with pebbles 6.4 in., or a compaction of 1.2 in. for limestone and 1 in. for pebbles.

An average of 456 lb. of limestone or 519 lb. of pebbles was used per square yard of slab. Each had an average specific gravity of 2.66.

After grout was discharged into the stone it was evenly distributed over the surface with street brooms, then the slab was rolled until the coarse aggregate was submerged and an even surface was obtained. Excess grout was then swept forward and the slab was rerolled, after which the surface was checked with a 16-ft. straight-edge and high spots were reduced with hand tamps. The remaining grout was again swept forward and the pavement was finished, either by brooming or belting.

Data on Grout

Grout was proportioned 1:2, the sand being measured dry and rodded. A batch of grout was proportioned 11 sacks of cement to 2,380 lb. of dry sand which, with the average quantity of water used, produced a little more than 32 cu. ft. of grout, and this filled an average of 17.4 sq. yd., or about 14.7 sq. yd. of slab per cu. yd. of grout.

The average water-cement ratio was $8\frac{1}{4}$ gallons per sack. This was reduced by absorption into the subgrade and coarse aggregate, evaporation during rolling and loss over the forms, so that the actual water-cement ratio when the grout was finally in place, was considerably less, which accounts for the average compressive strength of 3,146 lb. per sq. in. obtained from 13 cores having an average age of 31 days.

Construction differed from previous jobs in one respect—the coarse aggregate was not rolled before grouting. Rolling was omitted because it was believed that better penetration of the grout would occur in loose stone than in compacted stone. No difficulty was experienced because of this omission of rolling, the grout trucks having operated easily over the uncompacted stone and pebbles. It is believed, however, that a smoother riding pavement would have been obtained if the coarse aggregate had been rolled prior to grouting.

Pebbles proved as satisfactory as crushed stone, both from the standpoint of construction and of strength.

Transverse joints are a 1 by 6-in. board, installed at intervals of 200 ft. by trenching the leveled stone and staking the board in place on the subgrade. An inverted dummy longitudinal joint was provided by staking a 1 by 2-in. wood strip on edge on the subgrade. This strip was raised a little above the subgrade, with stones or pedestals of earth, so that it projected into the slab for $2\frac{1}{2}$ to 3 in.

The completed pavement was cured for 7 days, with wet burlap followed by wet earth.

Change Crews Twice a Week

Except for a few "key" men, the entire crew was changed each Monday and Thursday morning, each man working 3 days at 30 cents an hour. As scrip was available in $1.00 units only, the hours of work were arranged so that each man received $8.00 for the 3 days. Part of the time 50 men were employed on the road, while the quarry, sand pits and mixing plant employed an additional 15 intermittently throughout the job, so that some 200 heads of families worked for 3 days while another 15 had intermittent employment for 5 weeks, because of this construction. The business of the community was stimulated by the use of $10,000 in currency which would not otherwise have been available. In addition, the city has nearly three-fourths of a mile of pavement which it would not otherwise have had, and the regular relief agencies were relieved of some of their burden.

Better Housing Association Meets at Chicago

The National Association for Better Housing is holding its organization convention at the Union League Club at Chicago, Ill., Tuesday and Wednesday, Oct. 31 and Nov. 1.

"A concerted effort will be made to obtain favorable concessions for the home owner under the NRA," announced J. Soule Warterfield, vice-president of the Starrett Building Co. and chairman of the organization committee of the association. "Every effort will be made to keep costs within the limit of public acceptance for the home buyer. As this type of building utilizes the maximum amount of labor an upturn in such activity will do more to aid unemployment than any other form of construction for the building trades.

"My recent observations in Washington," continued Mr. Warterfield, "indicate that the administration will doubtless make favorable financial concessions to aid home building projects, and a unified recommendation by the National Association for Better Housing as to conditions and policies would be received with favor at the capital."

Blend of Silica and Portland Cement Modifies Quality of Concrete

Silica Combines with Liberated Lime During Hardening—Affects Volume Change, Strength and Heat Generation—Cement Manufacturing Costs Reduced

SCIENTIFIC search for the ideal concrete demands an investigation of the effect of each important variable, such as chemical composition and fineness of cement, water-cement ratio, richness of mix, gradation and properties of aggregate, method of compaction, and so on, upon each important property of concrete, such as volume changes, strength, heat of hydration, and durability. Much of this work has been accomplished, but much remains to be done.

In the August issue of "Concrete," page 15, appears a summary of a report of tests conducted at the University of California to determine in what manner the chemical composition of portland cement affects the heat of hardening. The authors of the report given here in summarized form were participants in the previous report. Both reports cover parts of a broad program of investigation designed to give users of cement a better appreciation of the significance of differences in chemical composition and physical properties of this universal construction material.

The present report is concerned mainly with the manner in which chemically activated siliceous materials, when added to portland cement, affect volume change, compressive strength and heat generation.—Editor.

Silica Combines with Liberated Lime

The effect of the addition or blending of siliceous materials with portland cement has been investigated quite extensively with respect to compressive and tensile strengths, but only slightly with respect to the other properties named.

During the hardening (or hydration) of portland cement, lime is liberated. This uncombined lime is undesirable because it is soluble in water and may be leached from the concrete. Finely divided silica is capable of combining chemically with the liberated lime at a rate which depends upon the curing temperature and upon the condition of the silica. Thus in the presence of silica the uncombined lime is made to serve in a secondary cementing or solidifying action. This suggests the possibility that the replacement of a part of the cement by a siliceous material may produce a concrete of improved qualities.

Economies in Manufacture of Cement

Aside from the effect of silica upon the quality of the concrete, other possible advantages may be important. There may be economies in the manufacture of this blended cement (a mixture of portland cement and silica) because of the smaller amount of clinker which must be burned and the relative ease with which the mixture may be ground.

New developments in portland cement for mass concrete now suggest a still greater economic advantage for the cement-silica blend. The grinding of a portland cement of low-lime content which would be suitable in itself for mass concrete work is considerably more difficult than the grinding of a cement higher in lime content.

These tests have shown that the best properties of blended cements are obtained when silica is blended with a portland cement of high-lime content. Thus the advantage of working with a clinker that is reasonably high in lime is added to the economy effected in burning and the beneficial effect of the silica upon grindability.

Important Properties Other Than Strength

In most structures the compressive strength of the concrete is far above structural requirements. It might, therefore, seem feasible to reduce the cement content and thus to sacrifice the extra strength in favor of a lower heat of hydration and lower volume change. No large reduction in cement content can be made, however, for the reason that workability, watertightness and durability must be maintained at safe levels. The problem, then, is to obtain the best combination of properties, with perhaps less emphasis on strength and more emphasis on properties such as contribute toward reducing volume changes and the tendency to disintegrate with time.

Scope of Tests

The tests here summarized have been conducted in the Engineering Materials Laboratory of the University of California to determine the influence of silica additions upon the following important properties:

1. Volume changes of mortar under various curing conditions.
2. Compressive strength of mortar under various curing conditions.
3. Heat of hydration (hardening) of cement.

Durability tests have also been planned, but these remain to be made. The blended silica-cement mixtures for the tests were made from three cements of varying lime contents, the chemical compositions of the cements differing mainly in percentage of tricalcium silicate. These cements were designated as "low-lime," "normal-lime" and "high-lime" cements. The table on the following page shows their composition.

The three portland cements used in the tests were se-

Condensed form report by R. W. Carlson and G. E. Troxell, presented at the annual meeting of the American Society for Testing Materials, June 26-30, 1933.

lected from a group of 25 cements manufactured for the investigations of cement for Boulder Canyon Dam.

The siliceous material blended with the cements is a volcanic ash from a natural deposit near Fresno, Calif. It occurs naturally in a finely divided state, 98 per cent passing the 200-mesh sieve. Its principal constituents are silica (75 per cent), alumina (15 per cent), and iron oxide (1 per cent).

It is known that calcination increases the chemical activity of siliceous admixtures, probably by changing the material from a partly crystalline form to the more active amorphous state. Since volcanic ash has been calcined by nature, it is more than ordinarily active. Nevertheless, it was thought best to determine the effects of further calcination, and in line with this decision a part of the volcanic ash was calcined to incipient fusion at approximately 2,200 deg. F. Another lot was heated to partial clinkering at approximately 2,100 deg. F. A third part was heated to 1,800 deg. F., and a fourth portion was not heated.

TABLE—PERCENTAGES OF PRINCIPAL COMPOUNDS IN CEMENTS USED IN TESTS

	Low-Lime Cement	Normal-Lime Cement	High-Lime Cement
Tricalcium silicate	33	55	70
Dicalcium silicate	45	23	10
Tricalcium aluminate	7	6	0
Tetracalcium alumino-ferrite	12	14	17

The heating of the first two portions to 2,200 and 2,100 deg. F., respectively, produced numerous coarse grains of fused silica, necessitating their grinding before blending them with the cements. Grinding to the fineness of 80 per cent passing the 200-mesh sieve was accomplished in a small batch mill. The third portion (heated to 1,800 deg. F.) and the fourth portion (not heated) were used as received.

Some of the blended cements were made by actually grinding the silica with the cements, after first pre-grinding the cement clinker. Others were produced by merely adding the silica to the cement. Various proportions of cement to either natural or calcined silica were used in the production of the blended cements, these proportions ranging from 100 per cent of cement and no silica to 60 per cent of cement and 40 per cent of silica, by weight.

Conclusions Drawn from Tests

The conclusions here presented are based upon the results of the limited number of tests completed to date, and they are purely tentative. Later test results may alter these opinions. It should be emphasized that the conclusions apply only to three types of portland cement, one type of silica (volcanic ash), four conditions of heat treatment of the silica, and five arbitrary sequences of curing and storage conditions. Nevertheless, the tests thus far made show promise in the use of a high-lime cement blended with silica, especially for mass concrete.

In order to investigate more fully the possibilities in the blending of silica and cement, and to determine the most favorable composition, further studies should be made on (a) use of different types of silica, (b) further variations in curing, (c) use of concrete instead of mortar specimens, (d) effect of exposure to sea water, and (e) relative manufacturing costs.

The detailed conclusions follow:

1. The contraction of mortar specimens upon drying is less at the early ages and greater at the later ages for cement-silica mixtures than for plain cement.
2. Contractions of mortar up to the age of 4 months are in many cases less for blends of high-lime cement with silica than for plain cement of normal-lime or of low-lime content.
3. The calcination of the silica has an appreciable effect upon the contraction of mortars containing blended cements; the higher the temperature of calcination, the less the contraction.
4. The expansion of mortar during a period of immersion in water is slightly greater with blended cement than with plain cement.
5. In general, the blending of active silica with cement tends to lower the compressive strength of mortars up to the age of 3 months. The amount of this reduction in strength is governed largely by the chemical composition of the cement.
6. At least 30 per cent of a high-lime cement can be replaced by interground silica without appreciable reduction in the compressive strength at the age of 3 months.
7. Higher compressive strength is obtained if silica is interground with cement than if silica is merely mixed with cement, at least up to the age of 3 months.
8. The heat of hydration of a blend of cement and silica is less than that of a corresponding plain cement, but the reduction is not proportionately as great as the percentage of replaced cement.

Acknowledgment is made to J. W. Fry, J. A. Jameson and R. J. Villagrana, senior and graduate students in civil engineering, who conducted most of the tests included in this investigation.

Paving Practice Discussion Is Reprinted

Existing specifications for concrete street construction are discussed in a 4-page folder entitled "The Trend of Concrete Paving Mixes." This is a reprint from the *Proceedings* of the American Society of Municipal Engineers of a paper prepared by E. K. Smith.

It is suggested that before cities start catching up on delayed street paving work, engineers should make a careful study of their specifications to determine in what respects revisions are needed. Copies of this reprint may be obtained, on request, from the Portland Cement Association, 33 W. Grand Ave., Chicago.

Code Hearings Held in Washington

Hearings on several of the codes submitted by various branches of the construction industry were held during September.

Original dates for hearings were set for the construction industry code for September 6, and for the cement manufacturing industry for September 15. The former code was submitted by the Construction League of the United States and the latter by the Cement Institute.

The concrete masonry industry code, filed by the national association, will be given a hearing October 5, in the Old House Office Building. Malcolm Muir, deputy administrator, will preside.

Build Recreation Rooms in Basements with Concrete Ashlar

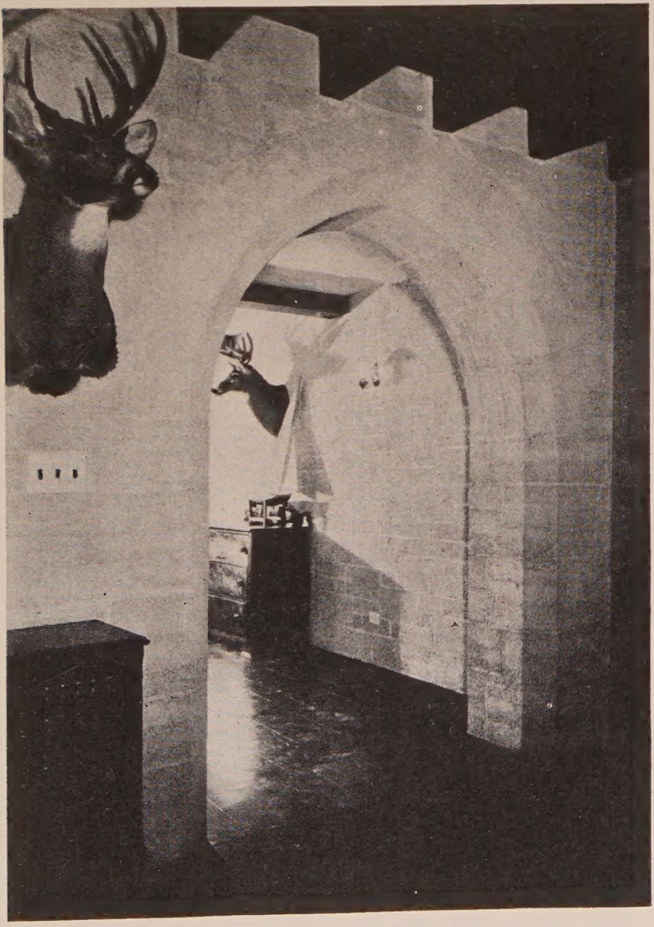
Winter Construction for Concrete Contractor
Selling and Advertising Aids Available
Use of Color Recommended

THE use of concrete ashlar units and other forms of concrete construction for converting ordinary dwelling-house basements into home recreation rooms promises to provide an active winter for many concrete contractors.

Opportunities for Winter Construction

Possibilities for winter construction work of this character exist in abundance in every community. The quantity of such work that reaches the actual contract stage will depend largely on the selling ability of local concrete contractors, for the selling problem extends no further than the private individuals who own and occupy the homes. Neither the PWA nor any other governmental agency is concerned with these little private contracts that lie at the feet of the concrete contractor who has sufficient alertness to see them and pick them up.

Co-operation with a local concrete products manufacturer and a local architect should prove helpful. A typical random ashlar wall set up in the office or plant of the manufacturer, or attractive sketches prepared by the architect, would be a distinct aid in convincing the home owner of the possibilities open to him.



Concrete ashlar walls, beam ceiling and tile floor provide an ideal home recreation room in winter

Walls of random concrete ashlar, coated with cement paint, help to make this basement an attractive playroom

Another powerful selling aid which should be in the hands of all contractors who decide to solicit this form of winter construction work will probably be available by the time this article appears in print. The aid to which reference is made is a new illustrated folder to be published by the Portland Cement Association, under the title of "Yesterday's Basement Is Today's Recreation Room."

The illustrations in the folder offer most convincing proof of the effects that may be obtained, although the methods of construction are relatively simple.

Still another form of selling aid is found in advertisements in local newspapers. Here, again, very practical assistance may be obtained from the Portland Cement

Association, this organization having prepared some single-column illustrated advertisements for this special purpose.

Construction Procedure; Floors

The construction procedure connected with the conversion of an ordinary basement into a recreation room is comparatively simple. To begin with, the work is indoors, in a heated building, so that no expenditure is required on winter construction features such as heating materials or keeping the inclosure warm.

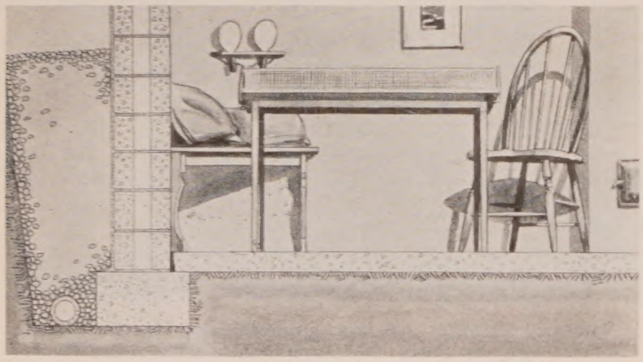
If the present floor is of concrete or brick, one of the most practical methods of treatment is a new topping coat of colored cement-and-sand mortar. A beautiful tile effect may be obtained, with small additional expenditure, by cutting joints in the mortar topping and filling the open joints with mortar of a different color.*

Ashlar Wall Construction

The walls, quite as much as the floor, offer an opportunity for artistic treatment. Only in rare cases is it wise to attempt to solve the wall problem wholly with paint, because basement walls, as usually constructed, do not present surfaces that are suitable for such treatment. A far more satisfactory effect may be obtained in random concrete ashlar, by setting a 3-in. or 4-in. wall (or furring) of ashlar against the face of the old basement wall. In this manner the finished wall will be true, quite unaffected by irregularities in the old wall.

Use of Patterns

The illustrations show clearly the highly attractive effects made possible by the use of random concrete ashlar. Best results in appearance are obtained if the mason uses a predetermined pattern in laying up the ashlar. Furthermore, the use of a pattern speeds up the work. A typical pattern, well adapted to random concrete ashlar masonry, will be found in an illustrated article on pages 24 and 25 of the March (1932) issue of CONCRETE. That pattern requires only four sizes of concrete masonry units. Other patterns are shown in an extensively illustrated publication entitled "Concrete Ashlar Walls," issued by the Portland Cement Association.



Drainage is needed to keep basements dry at all times

Color in Walls

It is needless to add that the use of concrete units of slightly varying tints, and having open-textured surfaces, will enhance the appearance. Or, if untinted concrete masonry units are used, so that painting seems desirable, beautiful results may be obtained by applying to the ashlar a base coat of a dark color, such as reddish brown, allowing it to dry, then applying a light buff coat rather sketchily so that the base coat may be seen through it. This or similar methods of painting surfaces will be found most practical in communities where tinted concrete masonry units are not manufactured.

The ceiling may consist of a flat surface of metal lath and cement plaster, to serve as fire protection, and painted a light cream or buff color. On the other hand, many basement recreation rooms have beam ceilings or other forms of treatment that eliminate completely the suggestion of a basement room.

Basements Must be Dry

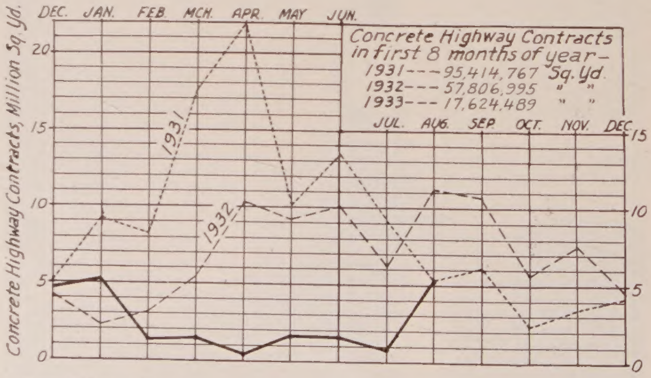
Recreation rooms in basements must be dry. This is a matter of health as well as comfort, and it must be given proper attention.

If the residence is in a wet or damp location, or if there is any question of proper drainage, such drainage must be provided. An effective method of drainage is shown in one of the illustrations. A trench is dug around the building, completely exposing the outer face of the foundation wall to the bottom of the footing. The wall is then cleaned, a ½-in. coat of cement plaster is applied, the drain tile are placed and connected up with the storm sewer or other outlet, and the trench is refilled, preferably with cinders or coarse gravel. If the scheme of landscaping requires it, the upper foot of the trench may be filled with soil.

Contractors who contemplate specializing in winter construction work of this character should communicate at once with the Portland Cement Association, with the view of obtaining the booklets and other sales aids previously mentioned.

Start Made on Highway Work

Contracts for concrete highway work in August, reported by the Portland Cement Association as aggregating 5,299,905 sq. yd. in the United States, reflected the first effect of the $400,000,000 fund made available under the public works feature of the National Industrial Recovery Act.



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Now that a start has been made, it is hoped that this work will be carried forward at a rapid rate without further delay.

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*This method is described in detail in the December (1932) issue of CONCRETE, page 11.

The Super Cement Fineness Analyzer

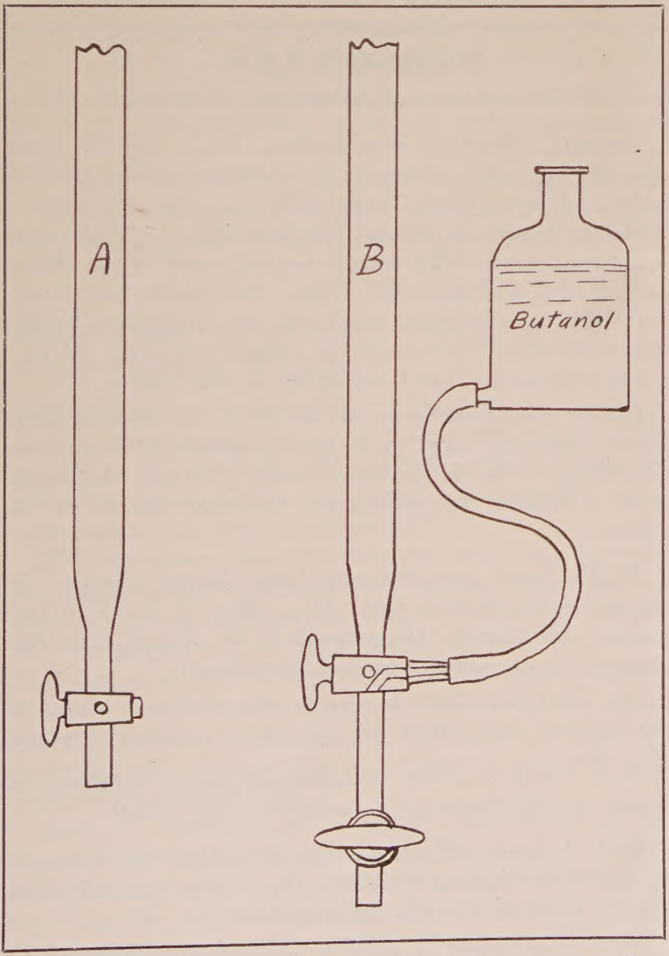
By S. RORDAM
Chief Chemist, Signal Mountain Portland Cement Co., Chattanooga, Tenn.

IN the February (1933) number of CONCRETE is published an article by E. W. Reed-Lewis, director of research of the Super Cement Co. The paper discusses the construction and use of a sedimentation burette for determination of the sub-sieve fineness of portland cement. The sample to be tested is dispersed in a column of butanol, and the material which settles to the bottom of the burette is drawn off at predetermined time intervals.

Experience Gained from Use

The writer has been using this sedimentation burette for some time, and as his experience may be of interest to other users of this burette a short summary of observations will be given.

The sedimentation burette as originally purchased was of the single stopcock type as indicated at A in the illustration. It was noticed that when the sedimentation times for 30, 20, 15 and 10-micron fractions were determined by using a fluorspar sample of known fineness, there would be a considerable discrepancy between the sedimentation times, as determined by drawing off ten samples at fixed intervals and the actual sedimentation times required to give the correct fineness results when checking back on the same sample of fluorspar.



Original burette shown at A was modified as shown at B

This was explained as being due to the fact that during the calibration of the burette the settled material is drawn off ten times, and every time a fraction is drawn off it is accompanied by a varying amount of cloudy liquid which does not really belong to the material which has settled out. On the other hand, when the actual test for fineness is made, only four samples are drawn off. Consequently this test will get only 4/10 of the cloudy liquid which was drawn off during the calibration, and the result is that the fineness test will not check up with the known composition of the standard sample of fluorspar. To get the results to check it will be found necessary to prolong the sedimentation times a good deal beyond the values found by the "calibration" test.

TABLE—COMPARISON OF SEDIMENTATION TIMES AS FOUND WHEN USING BURETTES HAVING ONE OR TWO STOPCOCKS

	—Original Burette—			—Modified Burette—			Composition of Standard Fluorspar
	Calibrated Time		Check on Fluorspar	Calibrated Time		Check on Fluorspar	
	Min.	Sec.		Min.	Sec.		
30μ	9	15	75.9%	11	30	75.0%	75.3%
20μ	24	35	59.9%	32	30	58.0%	58.1%
15μ	36	30	53.3%	50	30	50.7%	51.1%
10μ	56	00	46.4%	80	00	43.9%	43.9%

To overcome this, and to do away with the personal factor of greater or lesser skill in drawing off the samples, the burette was modified as shown at B in the illustration.

The Procedure

The use of this burette is very simple. The upper two-way stopcock provides an absolutely sharp division between material which has settled out—i.e. passed through the bore of the stopcock—and the material which is still in suspension but close to the bottom.

At the predetermined times the upper stopcock is closed, the bottom one is opened and the material which has collected in the tube between the two stopcocks is flushed out with butanol from the auxiliary bottle. This completed, the stopcocks are turned back to their original positions, and the material which has settled out above the two-way stopcock is made to flow down into the lower chamber by a light tapping on the burette.

Using this burette it was found that there was an absolute agreement between sedimentation times, as determined by the calibration, and the sedimentation times required to get correct results when testing the fluorspar sample.

The difference between results obtained with the two burettes is shown in the table. The same sample of butanol was used in both cases and the temperature was kept constant at 70 deg. F.

The general manipulations of the modified burette to avoid air bubbles in the stopcocks need not be mentioned here. It was found to be most convenient to blow the air in through the side opening of the upper stopcock. A small amount of sulphur compounds is leached out by the butanol from the rubber tubing on the auxiliary bottle. When the burette has been standing for any length of time this tube should therefore be flushed out.

It is important to clean the burette between tests. The fine particles cling to the wall of the burette, and if the inside of the burette is not quite clean at the beginning of the test the amount of fine material which hangs on the wall will vary from test to test.

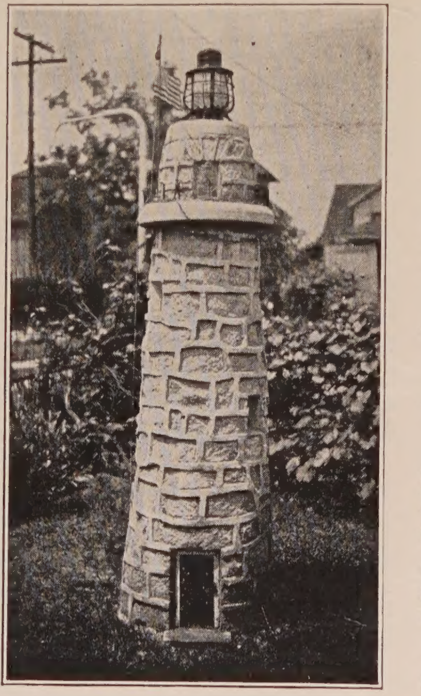
It is likewise important that the butanol is thoroughly dehydrated. A trace of moisture in the butanol is sufficient to start the very fine particles clinging together and settling out much too rapidly. The writer has found it a good practice to re-distill the butanol over quicklime and to use a $CaCl_2$-tube on the aspirator bottles.

Miniature Lighthouse Built as Garden Ornament

A miniature lighthouse built of broken field stones laid in portland cement mortar with wide joints is a unique garden ornament introduced by Holloway George, of Louisville, Ky.

The little structure is built on a concrete base, and the coping near the top is of concrete.

Small windows are built in the sides and a small door at the base. Electric lights are installed within the lighthouse. One light installed within the ornamental lantern at the top is made to flash automatically.



Lighthouse employing portland cement mortar constructed by Kentuckian

Wisconsin Products Men Organize Manufacturers' Association

Divide State Into Six Districts—Expect to Employ Full-Time Secretary

Concrete products manufacturers, acting on the belief that the construction industry is coming to life again, and that industries must be closely organized to operate smoothly under the NRA, held a meeting in Milwaukee on September 15 and formed a complete reorganization of the old Wisconsin Concrete Products Association.

The new organization is known as the Wisconsin Concrete Products Manufacturers' Association, Inc. Under the organization plan the state is divided into six districts, each represented by a director; and, in addition, there are three directors-at-large. The plan is to employ a full-time paid secretary as soon as the proper man can be selected.

The president of the new organization is Arthur Devos, of Wm. H. Devos, Inc., of Milwaukee; the first vice-president is Ed Olsen, of the Badger Concrete Co., of Oshkosh; the second vice-president is B. E. Dodge, of the Madko Concrete Products Co., of Madison; the secretary is L. E. Schwalbe, of the Economy Concrete Products Co., of Wauwatosa; and the treasurer is Arthur Vanderheiden, of the Pyramid Block Co., Milwaukee.

Mr. Vanderheiden is the director from the first district. The second district director is Arthur Sorenson, of Racine; the third is represented by Mr. Dodge; the fourth by Cal Gochnauer, of the Gochnauer Concrete Products Co., of Appleton; and the fifth by Albert Kruschke, of Eau Claire. The director for the six district, comprising the northern part of the state, has not as yet been appointed. The three directors-at-large are Arthur Devos, L. E. Schwalbe and Ed Olsen.

Mississippi Valley Assn. Convention Date Named

Secretary Lachlan Macleay, of the Mississippi Valley Association, has announced the tentative dates and place of the annual convention of that organization as Monday and Tuesday, November 27 and 28, at the Statler Hotel, St. Louis, Missouri.

PERSONALS

Edwin C. Eckel of Washington, D. C., has for some months past been retained as technical adviser to the Labor Advisory Board of the NRA on codes relating to industries based on mineral raw materials, and has acted as adviser on the NRA boards hearing most of the chemical, mining and quarrying codes. In October Mr. Eckel will take up geological work for the Tennessee Valley Authority, chiefly in connection with determining raw material supplies for local industries in that region.

During the continuance of his T. V. A. contract, Mr. Eckel retains the right to devote a fraction of his time to consulting work for private clients, provided that such work is outside the geographic limits of the T. V. A. region.

M. H. Small has been appointed district engineer in charge of the Kansas City, Mo., office of the Portland Cement Association. He succeeds E. R. Rogers, who has resigned to engage in business for himself.

Mr. Small had been in charge of association offices at Birmingham and Oklahoma City for a number of years.

B. E. Clark has been re-appointed district engineer in charge at Oklahoma City, succeeding Mr. Small.

John A. Burke, 35, vice-president and general manager of the New England Concrete Pipe Corp., passed away Sept. 9 at his home at Brookline, Mass.

Death was caused by injuries suffered in an automobile accident in July.

EDITORIAL

Cement-Bound Macadam Practice Modified

THE leading article in this issue describes an interesting departure from the usual specifications followed in the construction of cement-bound macadam pavement, during the construction of a road in Mason City, Iowa.

Present specifications call for three rolling operations. First, the loosely spread stone is rolled with a roller weighing not less than seven tons. Then, after the grout is placed, the second rolling is made immediately with a roller weighing not less than five nor more than seven tons, to facilitate the penetration of the grout. The final rolling is made later, with the roller used in the second operation.

In the work at Mason City the first rolling was omitted, in the belief that better penetration of grout will be obtained in the loose stone than is possible after the stone is rolled. A possible offset to this advantage is suggested in the expressed belief that a smoother riding surface may be obtained if the stone is rolled before grouting.

The question of cost is not important, for under present standard specifications one seven-ton roller can do all the rolling required. The question of interest to highway engineers is whether omission of the first rolling actually results in better penetration of the grout, and whether this supposed advantage is, in fact, offset by a less satisfactory riding surface.

Highway engineers will be interested in observing the results of this modification of present practice.

Build Highway Structures Regardless of Weather

DURING the coming winter, of all times, no let-up in the construction of highway structures can be permitted or excused. The slight additional cost of providing protection for concrete work should, in no case, cause the least hesitation.

The one great objective is to get men back to work on construction projects that utilize materials, so that more men will obtain work in connection with the production and transportation of those materials. The only way for the highway construction industry to reach that objective is to award contracts for every project that can be inclosed or protected, and to require actual construction to be prosecuted with the greatest possible speed.

Even in northern states much grading work can be done this fall, while in warmer areas the placing of concrete slabs and cement-bound macadam can continue for several months. In all sections of the country, regardless of climatic conditions, highway structures such as bridges, culverts, viaducts, and grade-separation structures, can be built without interruption, for all such structures can be inclosed.

Careful advance planning is needed, however, if highway departments in northern states are to get the greatest possible part of their federal allotments into circulation in the form of wages and payments for materials. Complete programs must be laid out, so that every structure that can be built in cold weather will be lined up and placed under contract.

Through the display of the proper degree of energy, highway departments can offset in some measure the blighting effect of past delays at Washington.

Responsibility for that delay rests with the public works administration. Responsibility for further delay will rest largely on the shoulders of state highway departments.

When the Codes Are Completed

SO much time and energy have been consumed in completing the NRA codes for the so-called large basic industries that the various codes involving the construction industry and its separate branches remain unfinished.

In the meantime the cheaters and the chiselers are still at work. Contracts are being taken at prices that can not produce a profit except on the basis of starvation wages, inferior workmanship and purchase of materials at prices below production costs. These contractors may have signed the President's blanket code, but it means nothing to them.

Patience and more patience will be required while the situation is being ironed out. During September several of the codes concerned with the construction industry were given hearings. Several others are scheduled for hearings during October. Eventually the code work will be completed, and order will step forth as chaos disappears.

When that day has arrived, proper measures can be taken against the cheaters and the chiselers.

The Curse Will Be Upon Them

MEN holding public office, contractors who have contracts, and engineers and architects who have commissions, are sometimes inclined to forget the army of men who are still without employment.

Some of these more fortunate individuals, secure in their own prosperity, will be found among the advocates of postponement of construction programs "until next spring."

Such an attitude can not and will not be tolerated in the winter of 1933-1934. Anyone who takes this attitude will find the curse of public opinion bearing down upon him.

PROGRESS—In a Page

◄ **Current activities in research, in matters pertaining to concrete and cement, as being carried on or completed by various organized groups.** ►

Effect of Curing Conditions on Mortar Specimens

TESTS were recently undertaken by the U. S. Bureau of Public Roads to determine if the strength retrogression sometimes observed in portland cement mortar specimens stored in water was due to solution of a part of the cement.

The results of the tests are reported by D. O. Woolf and K. F. Shippey in the August (1933) issue of *Public Roads,* published by the Bureau.

The theory that the retrogression in strength is due to the solution and removal of a part of the cement by the storage water is believed to be substantiated by these tests. This conclusion seems to be further verified from the fact that the retrogression in strength is most marked when the test specimens are stored in running water.

Present standard specifications for testing portland cement require that the specimens by cured in water. The tests reported by Woolf and Shippey do not indicate that any change in standard practice is necessary in this respect, at least not for ages up to and including 28 days. However, moist-air storage is recommended for tests of mortar specimens at ages greater than 28 days.

Automatic Recording of Setting Time

AN apparatus which allows the making of an automatic record of the progress in the setting of cement is mentioned in the June (1933) issue of *Building Science Abstracts* (London).

The apparatus, originally described by N. Davey in the *Journal of Scientific Instruments,* incorporates the essential details of the standard Vicat needle, with the additional advantages that the needle is cleaned automatically each time it has penetrated the cement, and that the time interval between each penetration may be varied to suit different types of cement (slow setting and quick setting). The apparatus has also been designed for use on small experimental samples of cement.

Wire Diameters for Aggregate Screens

SIMPLIFIED practice recommendation R147-33 covering wire diameters for mineral aggregate production screens, is now available in printed form, according to an announcement by the division of simplified practice of the Bureau of Standards, Washington, D. C.

Copies of this recommendation may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5 cents each.

Reports on Responsibility of Contractors

A mimeograph issued by the Bureau of Contract Information, Inc., 729 Fifteenth St., N. W., Washington, D. C., sets forth the purposes of this bureau, in supplying a nation-wide interchange of information between individuals or agencies responsible for awarding public and private construction contracts, and agencies concerned with the writing of surety bonds or the supply of finance and credit.

The mimeograph contains a summary of information thus far supplied on individual contractors and construction companies, with the view of eliminating irresponsible concerns from the field of contracting.

Standards for Absorption Tests Accepted as Tentative

TWO proposed standards pertaining to absorption by concrete aggregates, mentioned on this page in the August issue as having been submitted to the American Society for Testing Materials by Committee C-9, have been accepted as tentative A. S. T. M. standards.

The first, under the title of "Method of Test for Absorption by Aggregates for Concrete (Laboratory Determinations)," has been assigned the serial designation of C95-33T.

The second, entitled "Method of Field Test for Absorption of Mixing Water by Aggregates for Concrete," is given the serial designation of C96-33T.

Exposition of Chemical Industries

THE fourteenth annual exposition of chemical industries will open at the Grand Central Palace in New York on December 4.

This exposition, classified broadly, will include exhibits of raw materials, finished products, machinery and equipment, and educational exhibits. Sections will be devoted to equipment designed for handling materials, and to instruments of precision. Plastics will be the subject of a special group. Some of the more recent applications of these materials will be displayed for the first time.

Specifications for Ready-Mixed Concrete Accepted

THE American Society for Testing Materials has accepted as a tentative standard the Specifications for Ready-Mixed Concrete, submitted by Committee C-9. The serial designation of this new tentative standard is C94-33T.

This is the specification mentioned on this page in the August issue as being under preparation by Committee C-9.

Specifications for Ready-Mixed Concrete

THE American Society for Testing Materials has accepted as a tentative standard the Specifications for Concrete Pavements, submitted by Committee D-4 and mentioned on this page in the May issue as having been completed by a subcommittee.

This new tentative standard will carry the serial designation of D366-33T.

South Brooklyn Coal Pockets Involve Massive Reinforced Concrete

Track Stringers Designed as Continuous for Full 300-Ft. Length—Footings Continuous in Longitudinal Direction—Structure Supported on Concrete Piles

By M. HIRSCHTHAL
Concrete Engineer, D. L. & W. R. R. Co., Hoboken, N. J.

THE Lackawanna Railroad has built what the writer believes to be the largest retail coal pocket on the eastern seaboard. This structure, built mainly of reinforced concrete, is located at 25th Street and Gowanus Bay, Brooklyn (South) about a mile and a half from the immense U. S. Army Base, in a freight yard maintained chiefly for the purpose of distributing coal in the Brooklyn territory.

Capacity Is 4,500 Tons

The coal is shipped from the Scranton, Pa., anthracite coal fields via the D. L. & W. R. R. to Hoboken, N. J., whence it is lightered by car floats to South Brooklyn, transferred to the yard tracks by means of a transfer bridge, drilled and located (or "spotted") on the coal trestle over the coal hoppers into which the coal is emptied for storage, to be delivered to consumers as ordered. When entirely filled the capacity of this pocket is 4,500 tons.

The recent improvement in the anthracite coal business is due to the improved methods of handling and grading of the coal. The new methods preclude the possibility of the delivery of stone in the coal by means of the very simple method of passing the coal through water, the heavier stone sinking to the bottom while the real coal passes on. In addition, this pocket is designed to screen off the fine dust or unwanted sizes, so that the consumer receives only the size of coal ordered (and nothing but the coal to be burnt in the furnace—what he contracted to pay for).

Character of Structures

This freight yard improvement, aside from the track revision, includes pile and frame trestles, an embankment retained by precast concrete cribbing, together with the reinforced concrete trestle over and a part of the coal pocket, which latter section is protected from the weather by a shed and is equipped with offices and scales.

The reinforced concrete structure consist of 20 bays on 15-ft. centers with an overhang for the bumping post so as to accommodate the maximum number of cars over the hoppers. The partition wall between the last two hoppers was omitted and struts substituted so as to permit the flow of coal into the last hopper, since the last car dumper might be located beyond it. Concrete ledges were provided for the support of the ends of the timber stringers of the frame trestle. The width of the pocket to accommodate two tracks on 15-ft. centers is 40 ft. 0 in. out to out.

The track stringers were designed for a 140,000-lb. capacity coal car with concentrations of 52,500 lb. on each of the four axles, since these result in heavier moments and shears than do the drilling engines in use in the South Brooklyn yard. These stringers, spaced 5 ft. on centers for each track, were designed as continuous from end to end of the trestle, with the resulting section 18 in. wide and 27 in. deep. The reinforcement consists of four ⅞-in. round rods, of which two are bent up over the supports from either side and two ½-in. square bars are provided additionally in the upper plane for negative moment. For shear ½-in. square stirrups are provided in addition to the bent-up bars and the corbels at the ends. The rails are fastened directly to the concrete stringers by means of ¾-in. bolts through ⅞-in. round tin tubes spaced 21 in. on centers with the use of standard rail clips. The rails at the end bay and around the curve of the bumper were fastened by Richmond screw anchors to the concrete and a 6-ft. depth of strut provided, so that the two end bents would resist the impact of a trainload of cars against the bumper, which in turn is reinforced with two rails in the upper plane and eight 1-in. square bars in the lower and ¾-in. round vertical stirrups tying the two together. The loads of the stringers are transferred to the main piers of the bents by means of 18- by 24-in. columns under each stringer, reinforced longitudinally by four ⅞-in. round rods, tied together at 18-in. intervals by ½-in. square ties and stubbed into the transverse girders by four ⅞-in. round rods.

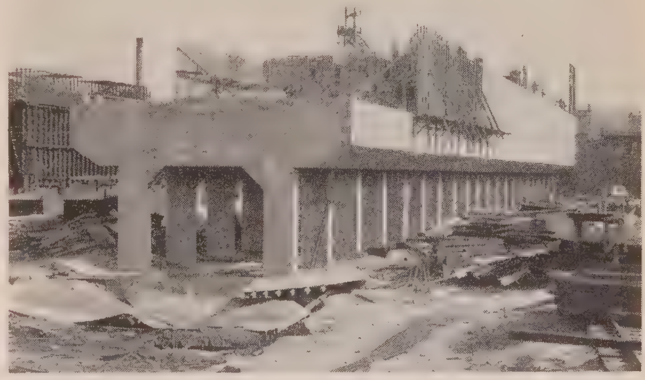


Figure 1. The massive character of this reinforced concrete coal pocket is shown in this construction view

The coal pocket slabs and side walls were designed to take the coal loads, figured at 50 lb. per cu. ft., with an angle of repose of 30 deg. Similarly to the track stringers, they were figured as continuous over all the supports. This required a thickness of 13 in. for the bottom slab with a reinforcement of ⅞-in. round rods 8 in. on centers, two of every three bars being bent over the supports for negative moment.

The side walls are 8 in. thick at the top and 12 in. at the bottom, the reinforcement varying from ½-in. square bars at the top to close spacing of ⅝-in. round rods at the bottom, with reinforcement in both planes at the supports and extending one-quarter of the span on either side into the adjacent span. The reinforcement of the cross walls is bent into the face walls in both directions to tie them in.

Transverse Girders at Bents

The transverse girder beams at each bent carry the concentrations of the track stringers as well as the coal loads transferred by the bottom slab and of the side and partition walls with two 7-ft. 6-in. cantilevers over the edges of the supports. These result in a girder 8 ft. 4½ in. deep and 24 in. wide, while the sloping bottom slab acts as bracing. The negative moment due to the cantilever requires the resistance offered by ten 1-in. square bars in two layers in the upper plane, of which three are bent as shear reinforcement, to which are added ⅝-in. round stirrups. The positive reinforcement consists of four 1-in. square straight bars and three 1-in. square bars bent up to act as shear reinforcement and at the same time as additional negative reinforcement for the cantilever. Stirrups of ⅝-in. rounds are also used here for additional shear reinforcement.

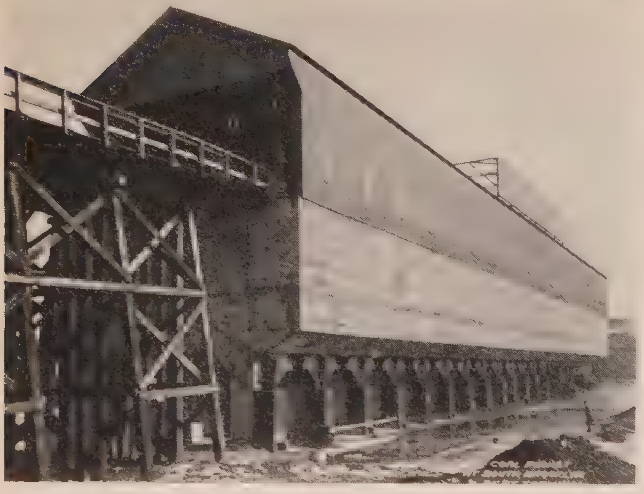


Figure 2. The completed coal pocket, surmounted by housing of corrugated iron on light steel frame

Two columns, each 24 by 48 in., carry the load transferred to them by these girder beams. The columns are reinforced longitudinally by ten 1-in. square bars with ½-in. square hoops or ties 18 in. apart.

Continuous Footings Supported on Piles

The footings are designed as continuous longitudinally along each row of columns, so as to permit of a design for a single condition of maximum loading over the whole structure and thus economize over a design for a maximum at each bent. both in the number of the concrete piles and the size of the footing as well as in the necessary excavation. The resulting footing is 4 ft. 6 in. wide with a depth of 3 ft., of which 6 in. is for pile embedment. The reinforcement consists of eleven 1-in. square bars, of which six are bent down in two planes with two additional 1-in. square bars in the bottom plane over the supports and six 1¼-in. square bars at the ends for negative moment. For additional shear reinforcement ⅝-in. round stirrups are provided.

Because of the softness of the soil, struts were provided at every fifth bay 24 in. wide by 36 in. deep, reinforced with twelve ¾-in. round rods and ½-in. square ties, so as to give more lateral stiffness to the foundations.

Concrete piles were spaced 3 ft. on centers in both directions, with a maximum allowable loading of 30 tons per pile. The length of pile required averaged 20 ft.

The maximum headroom provided is 13 ft. 6 in. for loading of trucks at the hoppers located along both faces of the pocket.

To provide for easier flow of coal within the pocket, crickets were provided so as to give a slope of 30 deg. This construction consists of lean cinder concrete fill with a 6-in. gravel concrete slab, reinforced with triangular mesh for wearing. Three concrete scale pits to provide weighing scales for the coal trucks are installed in front of the structure. On both sides of the pocket a reinforced concrete roadway 8 in. thick is provided, with concrete curbs at all the columns 13 in. high, protected with steel nosing.

The housing over the pocket consists of light structural steel trusses, columns and girts covered with corrugated metal. Offices are provided on the ground floor level at the inshore end of the structure.

Acknowledgments

This work was done partly by contract and partly by railroad company forces. The pile and frame approach bents, as well as all the filling and track work, were installed by company labor. The Turner Construction Company executed the work of the coal pocket, and the Raymond Concrete Pile Company installed the pile foundations.

All the construction and design were under the general direction of G. J. Ray, chief engineer of the D. L. & W. R. R. The design was under the supervision of J. L. Vogel, bridge engineer, and that of the writer, while the construction was under the supervision of M. H. Doughty, division engineer, with Ralph W. Sherwin, assistant engineer, in actual charge of construction.

From the Patent Office

By J. KAPLAN
Patent Attorney, Washington, D. C.

MANUFACTURE OF HIGH-ALUMINA CEMENT—U. S. Patent No. 1,913,943, June 13, 1933. John D. Morgan, South Orange, N. J., assignor to Doherty Research Co., New York, N. Y.

The method of manufacture consists of forming a mixture of finely ground alumina clay, limestone, silica and iron oxide in proportions to yield a cement having the composition 37½ to 41½ per cent Al_2O_3, 41 to 44½ per cent CaO, 7½ to 8½ per cent SiO_2, and 6 to 11 per cent Fe_2O_3, heating the mixture to a temperature below the sintering point and thereby dissociating carbonates and driving off water or carbon, further heating the mixture to a high fusion temperature of about 2,850 deg. F. and thereby forming calcium aluminate slag of the desired composition, gradually cooling the finished cement over a period of four to five hours, and pulverizing the stony product thereby obtained.

MANUFACTURE OF CEMENT—U. S. Patent No. 1,912,883, June 6, 1933. Alton J. Blank, Puebla, Mexico, assignor to Cement Process Corp. of Delaware.

A process of producing a cementitious product has been developed which consists of mixing lime in a form reactive to silica and alumina with a material selected from the group consisting of silica sands, siliceous earths and clays, and other argillaceous and argillocalcareous materials generally known to be suitable as the raw materials for supplying the siliceous and aluminous components in portland cement manufacture, and previously reduced to a fineness of approximately 90 per cent through a 200-mesh screen or fiber. Mixing is being carried on in the presence of an amount of water sufficient to insure hydration of any quicklime present and sufficient to insure the presence of free moisture in the mixture throughout the mixing operation, maintaining the mixture at a temperature of about 100 deg. C. or more to produce mutual reactions between the lime and the siliceous components of the material.

APPARATUS FOR BURNING LIME AND CEMENT—U. S. Patent No. 1,912,810, June 6, 1933. Eugene J. Wechter, Speed, Indiana, assignor to Louisville Cement Co., Louisville, Ky.

An apparatus for burning limestone or natural cement, in rock form, which comprises a rotary kiln, and means for introducing combustible fuel under pressure into the receiving end of the kiln. The material is formed into a mass whose depth in the hottest part of the flame formed from said fuel is less than that throughout the succeeding portion of the kiln. See also U. S. Patent No. 1,912,811, for additional development.

WATERPROOFING COMPOUND—U. S. Patent No. 1,913,430, June 13, 1933. Orville E. Cushman, Berkeley, Calif., assignor to Standard Oil Co., San Francisco, Calif.

A waterproofing composition miscible with water and particularly adapted for use in hydraulic cement compositions has been invented which comprises an emulsion in which water is in the external phase and containing a bituminous material, said bituminous material containing the product of reaction between oxides and hydroxides of polyvalent and alkaline earth metals and naphthenic acid in solution therein, said compositions also containing colloidal clay and water in quantities sufficient to form an oil-in-water emulsion.

CONCRETE PIPE, POLES. COLUMNS—U. S. Patent No. 1,910,643, May 23, 1933. James H. Sherrard, Westmount, Quebec, Canada.

This invention relates broadly to improvements in pipe, columns, and poles, and to the process of making them, particularly when made of reinforced concrete.

A thin-walled sheet metal tubular core is provide, reinforced either externally or internally, or both, with steel fabric reinforcement. The core is then filled with concrete or other material, and the exterior is given a protective coat of concrete.

PRE-CAST REINFORCED CONCRETE CONSTRUCTION—U. S. Patent No. 1,911,626, May 30, 1933. Herman G. Larzelere, Orlando, Fla.

This invention relates to structures formed of reinforced concrete, and the principal object is to eliminate the necessity of using removable forms in the field. Instead of using the ordinary wood or metallic forms in which to place the concrete, pre-formed slabs are substituted. Means are provided to tie the slabs together, forming tight troughs in which to deposit the concrete. When the concrete hardens the pre-formed slabs become a part of the structure.

PRODUCING DARK COLORED CONCRETE—U. S. Patent No. 1,910,419, May 23, 1933. Fred H. Amon, Weston, Mass., assignor to Godfrey L. Cabot, Inc., Boston, Mass.

The method of producing dark colored concrete without substantial loss of strength consists in forming a paste of a colloidal suspension of impalpable carbon black in water, mixing said paste with the ingredients of the concrete, and subsequently placing the concrete.

INCINERATOR AND GARBAGE BURNER OF CONCRETE—U. S. Patent No. 1,510,393. Thomas Fogg, Chicago, Ill. Patented September 30, 1924.

An object of the invention is the construction of a receptacle that will support refuse in such a manner that all moisture will be drained therefrom and all offensive odors conducted from the receptacle.

It consists of a number of communicating compartments having inclined bottoms to cause efflux of water to a trap. Draft may be regulated by an adjustable door.

ACIDPROOF CEMENTING COMPOSITIONS AND PROCESS OF PREPARATION—U. S. Patent No. 1,837,614. Anton Gramberg, Frankfort-on-the-Main, Germany.

An acid-proof cementing composition characterized by its excellent thermal conductivity and hardening power has been developed which comprises mixing with 400 parts of water-glass a cement powder consisting of 800 parts of a silicon-alloy composed of 85 per cent of silicon and 15 per cent of iron, 150 parts of clay powder and 50 parts of sodium silico-fluoride.

FLOORING COMPOSITION—U. S. Patent No. 1,911,631, May 30, 1933. Harold L. Levin, Nutley, N. J., assignor to The Flintkote Corp., Boston, Mass.

The flooring composition comprises a homogeneous mixture of hydraulic cement, fine material aggregate, and rubber in aqueous dispersion, the proportions of the ingredients being such that the rubber contained is substantially equal to about one-half the weight of the hydraulic cement contained in the mix and the weight of the aggregate is in excess of the total weight of rubber and cement.

CONCRETE GUN—U. S. Patent No. 1,911,514, May 30, 1933. Frederick H. Kernan, Irvington, Calif.

This invention relates to pneumatic concrete placing apparatus or so-called "concrete guns," particularly as used in the lining of tunnels with concrete.

The apparatus is hung low to the floor of the tunnel so as to permit of direct loading with the charge from an ordinary portable, cylindrical tilting concrete mixer carried on a flat car rolled in on the same track on which the "gun" is supported.

FORMING CONCRETE PILES IN THE GROUND—U. S. Patent No. 1,910,939, May 23, 1933. Albert C. Titcomb, Newton, Mass.

The apparatus comprises a cylindrical driving form, a substantially flat steel penetrating head, of greater area than that of the lower end of said driving form, engaging the lower end of said driving form and having a peripheral flange enclosing said lower end and spaced apart therefrom, and a yieldable packing of fibrous material containing a water-repellent substance within the flange.

CONCRETE FOR INSULATION—U. S. Patent No. 1,920,358. Horace N. Clark, Bridgewater Township, Somerset County, New Jersey. Patented August 1, 1933.

The concrete contemplated by this patent comprises an intimate mixture of 15 to 40 per cent of quick-setting portland cement, 20 to 30 per cent of diatomaceous earth, and 40 to 65 per cent of mineral wool.

ALUMINOUS CEMENT—British Patent No. 385,032. N. V. S. Knibbs, Westwood, Kent, England. September 14, 1931.

The process covered by this patent produces a cement similar in appearance to ordinary aluminous cement with respect to its hardening action, but which is more plastic than ordinary cements of this type.

SLAG CEMENT—U. S. Patent No. 1,912,815, June 6, 1933. George Witty, New York, N. Y.

A slag cement has been developed which consists of a finely ground mixture of granulated blast furnace slag, calcium hydroxide, sodium hydrate, magnesium silico-fluoride and calcium fluoride.

MOLDING CONCRETE PIPE—British Patent No. 381,721. To J. M. D'Artois.

This patent covers a method for molding concrete pipe and similar hollow concrete products, through the use of an expansible rubber core.

HOW TO DO IT

Questions and Answers
Consultation and Comment

A department devoted to the solution of problems encountered in concrete work. Readers are welcome to add to or improve upon the suggestions printed and to submit their views for possible publication.

Structural Designs in Light-Weight Concrete

Where can I obtain data required for the structural design of reinforced concrete in which light-weight aggregates are employed?—M. R. H., Zanesville, Ohio.

The structural designer is interested not only in the physical characteristics of light-weight concretes, and in the design constants applicable to them, but he should have a general idea of the economies resulting from the reduced dead weight.

The last-named feature is emphasized in an article headed "What Light-Weight Concrete Means in Dollars and Tonnage," in the January (1933) issue of CONCRETE, pages 9 and 10.

The article just mentioned refers in part to the Randall committee report published in the *Journal* of the American Concrete Institute, March, 1931, and included in the A. C. I. *Proceedings* for that year.

Specifications for light-weight concrete aggregates are in course of preparation by the American Society for Testing Materials. The full text of this proposed standard appears in the September (1933) issue of CONCRETE.

Getting down to physical characteristics and design constants, you are referred to the February (1931) issue of CONCRETE, pages 31 and 32, where you will find a discussion of results obtained from a series of tests conducted at the University of Illinois. This article is an abstract of a complete report appearing in the October (1930) *Journal* of the American Concrete Institute.

Those Chemical Symbols

In reading your article on "How Composition Affects Hardening," on page 14 of your August issue, it seems to me you are doing the Theodore act with those time-honored chemical symbols for tricalcium silicate, dicalcium silicate, etc. I had to rub my eyes before I could believe it, and the library sylphs urged me to jack you up on it.—J. G. F., Atlanta, Ga.

The abbreviated chemical symbols to which you refer are not ours. They were first used about two years ago by industrial chemists, who had doubtless become tired of writing (and reading) $3CaO.SiO_3$ for tricalcium silicate when C_3S answers the purpose just as well.

Similar abbreviations, or short symbols, are used for dicalcium silicate, tricalcium aluminate, and tetracalcium alumino-ferrite, these three, together with tricalcium silicate, constituting the principal compounds of portland cement.

Since the first use of the short formulas they have been adopted by a considerable number of writers. Perhaps you will bring this fact to the attention of the fairies at the library.

Paint for Concrete Steps

I would be pleased to know where to get a paint or varnish suitable for covering concrete steps of a schoolhouse stairway which is subjected to much wear.—L. N. H., Angelica, N. Y.

It would be a very difficult matter to apply a concrete paint capable of resisting the wear of foot traffic on steps.

However, you are referred to a short article headed "Paint Types and Specifications for Painting Concrete," appearing on page 30 of the January (1932) issue of CONCRETE. As there explained, cement paints are of two general types, namely, cement-and-oil and cement-and-water. Most manufacturers of paint can supply these products.

The American Paint and Varnish Manufacturers' Association, about 5 years ago, published a specification for the application of concrete paints as Circular No. 327. In 1928 the Portland Cement Association issued a similar specification as Technical Data Sheet No. 46.

Specifications for Cast Stone

Where can I get specifications for concrete cast stone of the type used in building construction?—E. A. J., Waco, Texas.

Working specifications to be used as a part of the complete architects' specifications covering building construction appear on page 12 of the July (1932) issue of CONCRETE. These are the specifications recommended by the Cast Stone Institute.

Federal Specification SS-S-721, Cast Architectural Stone, adopted early in 1932, may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

The American Concrete Institute specification P-3-A-29T may be obtained by addressing that organization at 641 New Center Building, Detroit, Mich.

Fisk Concrete Pavement

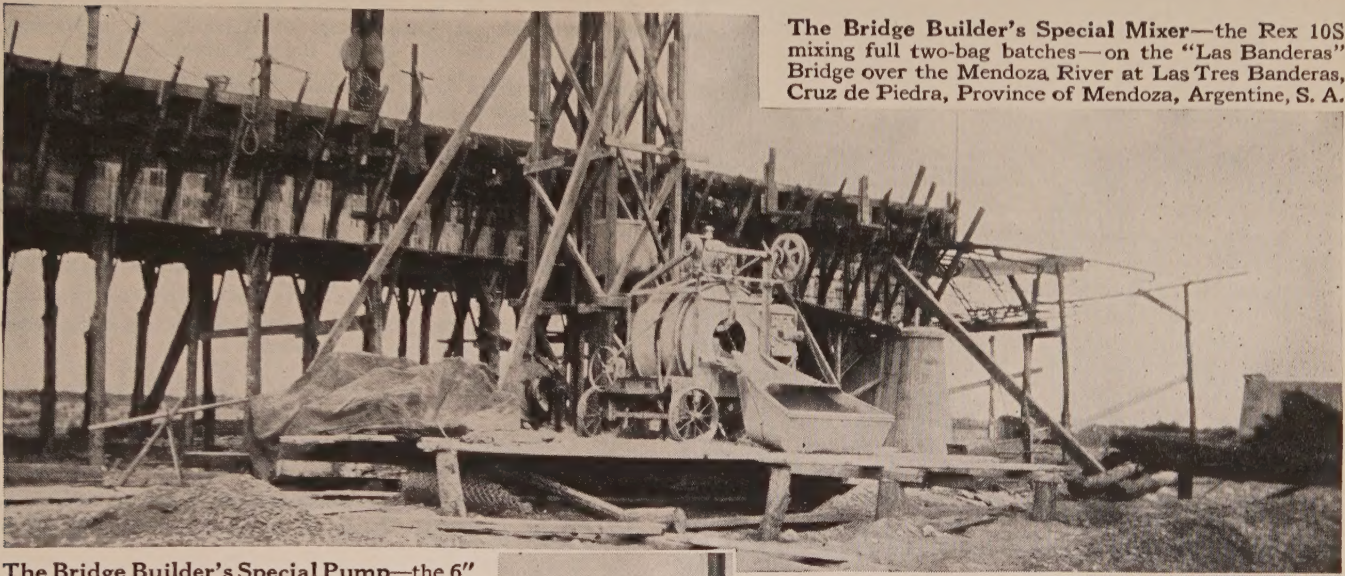
I am trying to get some information on the method of concrete pavement construction known as Fisk concrete, used in the East some years ago.—C. B. H., Lowell, Mass.

The Fisk concrete type of paving material was not a cement concrete. It was essentially an asphaltic concrete, consisting of a mixture of gravel, broken stone, cinders and coal ashes, with some binding material such as asphaltum or tar.

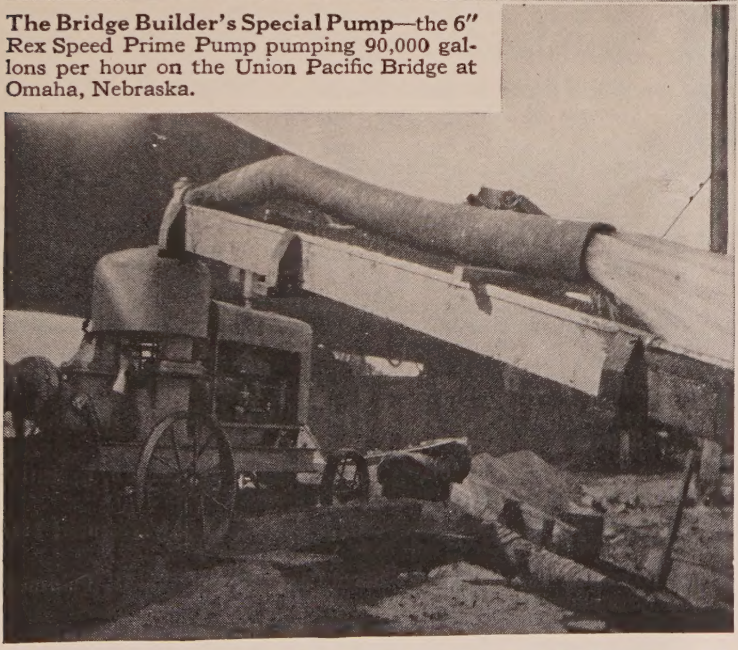
It was placed to some extent in New York City many years ago, and is described in an article on pages 605-606 of *Harper's Weekly*, September 18, 1869. Bound volumes of *Harper's Weekly* can be obtained in the public libraries of most large cities.

Before you Bid or Build A BRIDGE JOB

see the REX BRIDGE BUILDER'S SPECIALS



The Bridge Builder's Special Mixer—the Rex 10S mixing full two-bag batches—on the "Las Banderas" Bridge over the Mendoza River at Las Tres Banderas, Cruz de Piedra, Province of Mendoza, Argentine, S. A.



The Bridge Builder's Special Pump—the 6" Rex Speed Prime Pump pumping 90,000 gallons per hour on the Union Pacific Bridge at Omaha, Nebraska.

The Bridge Builder's Special Saw Rig—the Rex No. 5 cutting timber for the forms on a Wisconsin bridge job.

CHAIN BELT COMPANY • MILWAUKEE, WISCONSIN

REX CONSTRUCTION EQUIPMENT

THE MOST COMPLETE LINE BUILT

Eastern Office
Room 529, Chrysler Bldg., New York City

Main Office
1665 W. Bruce St., Milwaukee, Wis.
Distributors in all principal cities

Western Office
909 Harrison St., San Francisco, Calif.

New Books and Pamphlets

Concrete Design Charts

Albert Design Charts. By Odd Albert. Published by the Opla Company, P. O. Box 66, East Orange, N. J. Individual charts punched for loose-leaf binding. Size 8½ by 11 in. Price varies with number ordered.

This is a complete set of charts for the convenient design of reinforced concrete work. Separate charts are prepared for the design of slabs, simple and continuous beams, columns under compression, columns under combined compression and bending, and various other structural features. Each chart contains an example to illustrate its use.

Designers will find these charts extremely useful.

Rigid-Frame Concrete Bridges

Analysis of Rigid-Frame Concrete Bridges is the title of a new 32-page book published by the Portland Cement Association, 33 W. Grand Ave., Chicago. Designers may obtain copies on request.

The book contains the necessary data used in the analysis of rigid frames, including charts giving coefficients for design. An example is given in the form of an analysis of a concrete bridge of the rigid frame type, the method employed being the moment distribution method for live and dead load, earth pressure, volume changes and footing displacement.

Proceedings of N. C. B. V. A.

Proceedings of the Fourth Annual Meeting of the National Concrete Burial Vault Association are now available in printed form in a book of 80 pages.

A paper of special interest is that presented by W. G. Kaiser, manager of the cement products bureau of the Portland Cement Association, on mixtures for vibrated concrete in the production of burial vaults, and the author's discussion of the results of demonstration tests conducted during the annual meeting. Mr. Kaiser's paper appears in condensed form in the July issue of Concrete, pages 13-14.

Fireproof Home

Our New Home Is Fireproof, by Roberta Weeks. Published by the Portland Cement Association. Twelve pages, 8½ by 11 in., extensively illustrated.

This unusually attractive and colorful booklet describes the concrete masonry residence of Leo Weeks, Des Moines, Iowa, for which the architect was Amos B. Emery, of the same city. Copies should be in the hands of every architect interested in home planning, and products manufacturers will find in it a promotional booklet of exceptional value.

Proceedings of Road School

Proceedings of Nineteenth Annual Road School is the title of a 114-page publication issued by the engineering extension department of Purdue University, Lafayette, Indiana.

The book contains a number of papers of interest to highway engineers, presented at the nineteenth annual road school from January 23 to 27, 1933.

ORGANIZATIONS

American Association of State Highway Officials; W. C. Markham, Executive Secretary, 1222-24 National Press Building, Washington, D. C.

American Concrete Institute; Harvey Whipple, Secretary, 641 New Center Building, Detroit, Mich.

American Concrete Pipe Association; M. W. Loving, Secretary, 33 West Grand Ave., Chicago.

American Road Builders' Association; Chas. Upham, Engineer-Director, National Press Building, Washington, D. C.

American Society of Civil Engineers; Geo. T. Seabury, Secretary, 33 West Thirty-Ninth St., New York City.

American Society for Testing Materials; C. L. Warwick, Secretary-Treasurer, 1315 Spruce St., Philadelphia, Pa.

Associated General Contractors of America; E. J. Harding, Managing Director, 222 Munsey Bldg., Washington, D. C.

Building Officials Conference of America; Wm. F. Hurd, Secretary, Room 203, City Hall, Indianapolis, Ind.

Cast Stone Institute; L. A. Falco, Secretary, Chapel St. and Blatchley Ave., New Haven, Conn.

Cement Institute; H. C. Lundborg, General Manager, 11 East 44th St., New York City.

Concrete Masonry Association; Jack Franklin, Secretary, 7071 Plankinton Bldg., Milwaukee, Wis.

Concrete Reinforcing Steel Institute; R. W. Johnson, Secretary, 333 North Michigan Ave., Chicago, Ill.

Engineering Institute of Canada; 2050 Mansfield St., Montreal, Quebec.

Highway Research Board; Roy W. Crum, Director, 2101 Constitution Ave., Washington, D. C.

Joint Committee on Standard Specifications for Concrete and Reinforced Concrete; F. R. McMillan, Secretary, 33 West Grand Ave., Chicago.

National Association for Better Housing; Henry A. Guthrie, Secretary, 59 East Van Buren St., Chicago, Ill.

National Board of Fire Underwriters; W. E. Mallalieu, General Manager, 85 John St., New York City.

National Concrete Burial Vault Association; J. H. Stuart, Secretary-Treasurer, Bremen, Ohio.

National Crushed Stone Association; J. R. Boyd, Secretary, 1735 14th Street, N. W., Washington, D. C.

National Engineering Inspection Association; B. H. Witherspoon, Secretary, P. O. Box 1115, Pittsburgh, Pa.

National Fire Protection Association; Franklin H. Wentworth, Secretary, 40 Central St., Boston, Mass.

National Lime Association; Norman G. Hough, Secretary and Manager, 927 Fifteenth St., N. W., Washington, D. C.

National Ready-Mixed Concrete Association; V. P. Ahearn, Secretary, 545 Munsey Bldg., Washington, D. C.

National Sand and Gravel Association; V. P. Ahearn, Executive Secretary, 545 Munsey Bldg., Washington, D. C.

National Slag Association; H. J. Love, Secretary-Treasurer, 1449 Leader Bldg., Cleveland, Ohio.

National Terrazzo and Mosaic Association; J. M. Fuhrman, Secretary-Treasurer, 524 Brook Street, Louisville, Ky.

Northwest Concrete Products Association; W. P. Hews, Secretary-Treasurer, Yakima, Wash.

Portland Cement Association; Edward J. Mehren, President; William M. Kinney, General Manager, 33 West Grand Ave., Chicago.

Rail Steel Bar Association; H. P. Bigler, Engineering Secretary; Builders' Bldg., 228 N. La Salle St., Chicago, Ill.

Wire Reinforcement Institute; R. D. Bradbury, Director, National Press Bldg., Washington, D. C.

Wisconsin Concrete Products Manufacturers' Association, Inc.; L. E. Schwalbe, Secretary, Wauwatosa, Wis.

Cold weather coming . . . But

CONCRETE CURED WITH CALCIUM CHLORIDE

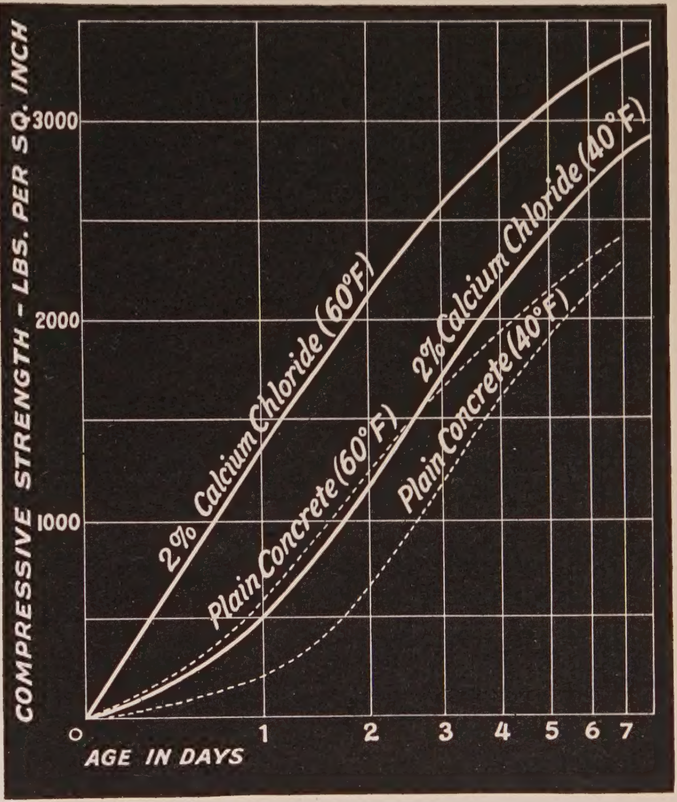
CAN "TAKE IT". . .

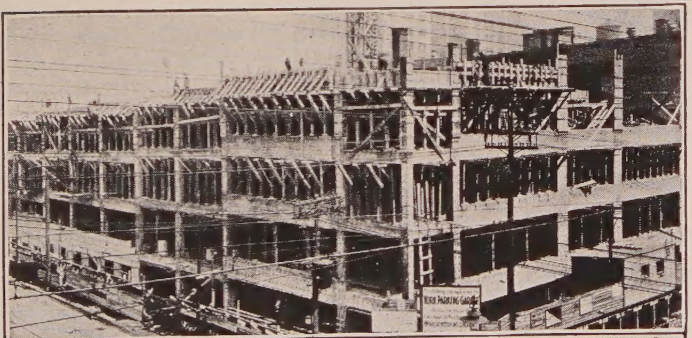
The use of Calcium Chloride in the concrete mix permits a "year-round" construction period and eliminates the necessity of seasonal "lay-offs."

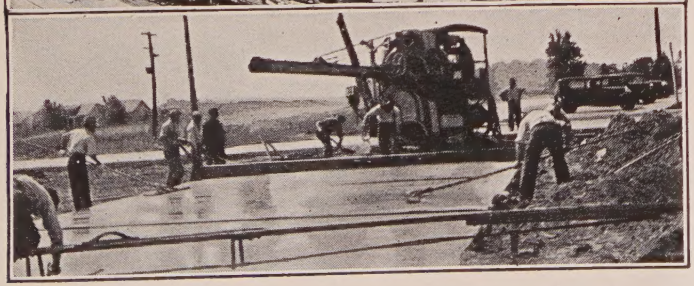
SATISFACTORY fall and winter concreting is insured with the integral use of Calcium Chloride. Two pounds of Calcium Chloride per sack of cement produces acceleration of the set and permits laying of concrete during low temperatures.

High early strength may be obtained in a minimum of time, thus speeding the opening of pavements to traffic or the removal of construction forms to permit rapid building progress.

The use of Calcium Chloride in the mix also insures *proper* curing of concrete. Tests made by the Ohio State University show that concrete in which Calcium Chloride is incorporated attracts and holds the needed moisture for maximum hardening.







Results of tests plotted show Calcium Chloride concrete to have twice the strength of plain concrete the first twenty-four hours.

Calcium Chloride is easily handled in the field or incorporated in the concrete mix at the central mixing plant.

Send—today—for descriptive literature and other details pertaining to Calcium Chloride concrete curing. Address any of the undersigned members of this Association.

CALCIUM CHLORIDE ASSOCIATION

SOLVAY SALES CORPORATION 61 Broadway, New York City
THE COLUMBIA ALKALI CORPORATION Barberton, Ohio
MICHIGAN ALKALI COMPANY 10 E. 40th St., New York City
THE DOW CHEMICAL COMPANY Midland, Michigan

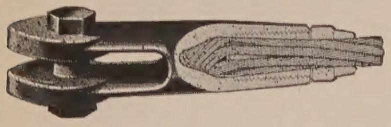
CALCIUM CHLORIDE • for modern concrete curing

EQUIPMENT AND MATERIALS

Tiger-Claw Wire Rope Socket Comprises Three Parts

Simple attachment in the field and 100 per cent cable strength are two of the features said to be offered by the American Steel & Wire Co.'s new Fiege Tiger-Claw wire rope socket.

The device is composed of three parts—a stock, a sleeve, and a plug, which are designed to accomplish the entire task.



Ordinary labor, quickly trained, is capable of handling the job. The need for flame or pouring of hot metal is said to be eliminated entirely.

Further details will be sent in response to a letter addressed to the American Steel and Wire Co., Room 1404, 208 South La Salle St., Chicago.

●

Wood Flour Finds Use as Curing Agent

A covering in concrete curing is one of the uses to which Wood Flour is being put. A function being developed is that of a cheap filler.

Wood Flour is a product of Lumber Bi-Products, Inc., Buffalo, N. Y.

It is finely pulverized wood, refined into several grades. It is said already to be finding use as a filler in numerous formulas to replace more expensive ingredients.

Samples are available upon request.

●

New Air-Cooled Engine by Doman & Marks

Designed especially to supply the demand for an air-cooled engine in the compressor and truck, a new 6-cyl. power plant, developing 104 brake h.p. at 2600 r.p.m. with 4 in. bore and 5 in. stroke, has just been announced by Doman & Marks, automotive engineers, Syracuse, N. Y.

Complete lines of 4, 8 and 12-cyl. power plants are now being designed.

●

Standard Oil Introduces Integral Waterproofing

A new integral waterproofing compound has been developed and patented by the Standard Oil Co. of California. It is an emulsified product of paste-like consistency which is said to disperse readily in the mixing water. It may also be added directly to the mixer.

In the hardening of the concrete, the emulsion breaks and a highly water-resistant material is deposited throughout the mass. This material consists of a selected heavy mineral oil, or an asphalt, in which water-repellent metallic soaps have been dissolved or colloidally suspended.

●

Seek to Meet Varied Truck Requirements with Two New Models

Further diversification of its line, to meet specific requirements in various trucking fields, is announced by the General Motors Truck Co., Pontiac, Mich., which is introducing two modifications of existing models in the medium duty class—one an option of Model T-33 and the other of Model T-43.

The former option, designated as Model T-33L, has a straight rating of 12,500 lb. with recommended body and payload weights ranging from 5,080 to 7,870 lb. It is powered by the GMC 221 cu. in., truck-built, valve-in-head engine developing 69 hp. and 155 ft. lb. torque. Four wheelbases are available—142, 154, 166 and 184 in. for body lengths of 9, 10½, 12 and 15 ft.

The other, designated as Model T-43T, has been designed strictly as a tractor unit, with straight rating of 16,000 lb. and combined gross weight for tractor semi-trailer recommended at 29,200 lb. When used with the GMC Model TT-252 semi-trailer, carrying payloads up to nine tons, increased performance is provided through the use of the GMC 331-cu. in., truck-built, valve-in-head engine developing 94 hp. and 230 ft. lb. torque.

●

Seapak Is New Insulating, Curing, Agent

The Seaman Paper Co., Chicago, is now marketing Seapak, said to consist of pure, untreated kapok having a thin membrane of paper on one side.

Its possible uses include the soundproofing of walls and floors, and as a curing blanket on floors and other large concrete areas and paving.

All Seapak comes in sheets or rolls. The plain type is made ordinarily in two thicknesses: 90-point and 125-point. This range is from about an eleventh of an inch to approximately one-eighth of an inch in thickness. The paper membrane is about .003 inch thick.

Industrial Literature

Pumping Tables

Tables of water friction in 100 ft. of pipe, the velocity head in pipes, and the practical suction lifts for various altitudes, are found in a new publication on *Rex Speed Prime Pumps,* issued by the *Chain Belt Co.,* Milwaukee, Wis. Pressure conversion tables and general information are also included. Curves show performance of primers when used in tests under field conditions.

●

Testing Machine Development

A few of the most recent developments in testing machines and instruments and in balancing machine equipment comprise the exhibit of the *Tinius Olsen Testing Machine Co.,* of Philadelphia, at A Century of Progress, Chicago.

Views of the exhibit are contained in a 6-page mailing piece now being distributed. A list of the devices shown is also included.

●

Laboratory Equipment

Philips Metalix X-ray Apparatus Model 200 is covered in *Publication* 3 issued by the *Industrial X-Ray Corp.,* Los Angeles, Calif.

Descriptive matter is complete and illustrations include those of the interior, the control desk, chassis trailer hitch detail and of the cabinet, cables and tube in diagram. A time exposure chart for iron and steel is given.

Manufacturers' News

Pottsco Block Plants

Some fifteen or twenty plants will soon be producing Pottsco building units under a general plan detailed in a leaflet issued by the *Pottsco Sales Co. of Michigan,* a subsidiary of the *Pottsco Corp. of Chicago.*

The coming production of light-weight slag aggregate was erroneously mentioned instead, in an item in these columns in the September issue.

●

Brown-Bevis Equipment Co. Appointed

The Brown-Bevis Equipment Co., of Los Angeles, has been appointed as southern California distributor for the construction equipment division of the *Chain Belt Co.*